blower vibrates in bending mode, said coupling segment rocks smoothly within a mating coupling of the support housing.

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39. The laser of Claim 38, wherein said coupling segment includes a narrowed end portion which is slightly thinner than a thicker middle portion.

REMARKS

ELECTION/RESTRICTION

Claim 2, as now amended, reads on the elected species and is also dependent from Claim 1 which is generic to the elected species I and to the non-elected species II, each as defined at page 3, item 5 of the restriction requirement. Claim 8 also reads on the elected species I. Claims 14-23 have been cancelled as being drawn to non-elected species. Claims 24-30 have been amended to recite a gas discharge laser including a cross-flow blower. Claims 34-35, as now amended, depend from Claim 32 which is also generic to the elected species I and the non-elected species II.

DRAWINGS

Figures 1-5, 10A, 10B and 16 have designated by the legend "PRIOR ART", as suggested by the Examiner and as illustrated at the Letter to Official Draftsperson enclosed with this amendment. The Examiner's objection under MPEP 608.02(g) is overcome.

The arc angle in the range of 50° to 10°, the extruded profile, the discharge circuit and the motor have each been cancelled from the claims and the Examiner's objection under 37 C.F.R. 1.83(a) is overcome without further amendment to the drawings.

CLAIM OBJECTIONS

Claim 38 has been amended as suggested by the Examiner, and the Examiner's objection is overcome.

CLAIM REJECTIONS UNDER 35 U.S.C. 112

Claims 1, 3-7, 9-13, 31-33 and 36-43 are rejected under 35 U.S.C. 112, second paragraph as being indefinite. Claims 1, 3-7, 9-13, 31-33 and 36-43 have been amended and the rejection is overcome. It is respectfully submitted that the amendments to overcome this rejection are neither intended nor believed to narrow the scope of any of these claims.

CLAIM REJECTIONS UNDER 35 U.S.C. 102

Claims 31-33 and 38-40 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent no. 4,760,581 to Hoag. The Examiner's rejection is respectfully traversed for the reasons that follow. Claims 31-33 and 38-40 have been amended only to overcome the Examiner's objections and rejection under section 112 and, as mentioned above, are neither intended nor believed to be narrowed in scope by these amendments.

Claim 31 recites a gas discharge laser including a cross-flow blower assembly including a flange supportingly disposed between a pair of cross-flow blowers, wherein the flange angularly overlaps a cylindrical cross-sectional perimeter of said blowers by less than 50%. As understood, Hoag does not disclose this feature. Instead, the flange, or blocks 65b, 65c, of Hoag is believed to overlap fully 100% of the cylindrical cross-sectional perimeter of the fans 63a, 63b, 63c, just as the conventional flange 201 fully overlaps the cylindrical cross-sectional perimeter of the tandem blower 202 illustrated at the cross-sectional view of Applicant's Figure 5. The flange 301 of Applicant's Figure 7 is illustrative, but not limiting, as to how the flange of

Applicant's invention as set forth at Claim 31 differs from the block 65b, 65c of Hoag and the flange 201 of Applicant's Figure 5, i.e., a substantial proportion (more than 50%) of the perimeter of the cylindrical form of the blower in cross-section is not overlapped by the flange 301. This advantageously permits substantial interflow of gases propelled by each of the blowers prior to reaching the discharge volume of the laser, and thereby provides a more homogeneous laser gas within the discharge volume and, e.g., enhanced stability of laser output beam parameters, etc.

Claim 32 requires that the flange angularly does not overlap a downstream arc of a cylindrical cross-sectional perimeter of said blowers. As such, Claim 32 is allowable for the reasons set forth above with respect to Claim 31. Claim 33 is allowable as being dependent from Claim 32.

Claim 38 recites a gas discharge laser including a cross-flow blower assembly including a shaft, the shaft including a coupling segment with a longitudinally non-uniform thickness, such that when the blower vibrates in bending mode, the coupling segment rocks smoothly within a mating coupling of the support housing. As understood, Hoag does not disclose this feature. Instead, the shaft 61 disclosed by Hoag at Figures 3 and 6, e.g., does not have a non-uniform thickness and instead appear to have a same diameter everywhere the shaft is illustrated by Hoag, just as the conventional shaft illustrated at Applicant's Figures 10A-10B. Applicant's advantageous shaft is illustrated by the non-limiting example at Figures 11A-11B as to this non-uniform thickness, e.g., having a larger diameter D_{max} around the center 503 of an end portion 501 of shaft 502 than the diameters D_{min1} and D_{min2} at the ends 504 and 505 of the end portion 501. Of course, coupling segments of other shapes than that of Figure 11A and within the scope of Applicant's invention as set forth at Claim 38 advantageously rock smoothly within a mating coupling of a support housing of a gas discharge laser. Claims 39-40 are allowable as being dependent from Claim 38.

Claim 36 is rejected as being anticipated by admitted prior art. Claim 36, as now amended, is dependent from Claim 32, and Claim 32 is allowable over Figures 4 and 5 of

the present application as admitted prior art for the reasons set forth above with respect to the Examiner's rejection of Claim 32.

Claims 41-43 are rejected as being unpatentable over Hoag. Claims 41-43 are allowable as being dependent from Claim 38. As discussed above, Applicant's invention as set forth at Claim 38 includes a coupling segment of a shaft of a blower with longitudinally non-uniform thickness. This coupling segment advantageously rocks smoothly within a mating coupling of a support housing of a gas discharge laser. As discussed with reference to Figures 10A-10B and pages 9-10 of Applicant's specification, a conventional coupling segment having uniform thickness tends to wear due to bending mode vibration of the blower as it rotates in operation and because the conventional coupling segment of uniform thickness is constricted at the mating coupling or end hub of the blower.

ALLOWABLE SUBJECT MATTER

Applicant's acknowledge and appreciate that the Examiner has indicated the allowability of Claims 1, 3-7 and 9-13 if rewritten to overcome the rejections under section 112 of Title 35 of the United States Code. Claims 1, 3-7 and 9-13 have been so rewritten and are allowable. Applicant's further acknowledge and appreciate that the Examiner has indicated the allowability of Claim 37, which has not been rewritten into independent form, however, because its base Claim 36 is allowable for the reasons set forth above.

In the event any fee is required for filing the above-noted document, including any fees required under 37 CFR 1.136 for any necessary Extension of Time to make the filing of the attached document timely, the Assistant Commissioner is hereby authorized to charge the fee to our Deposit Account No. 50-0612. A duplicate copy of this page is enclosed.

Respectfully submitted,
Sierra Patent Group, Ltd.

Dated: 10-25-02

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1. (Amended) A gas discharge laser, comprising:

a housing;

[an upper] a first electrode;

a [lower] second electrode;

a [lower] second electrode support;

a first cross-flow blower section, comprising a plurality of radial blades, further comprising a plurality of internal hubs and two end hubs, each of said internal and end hubs coupling with a first shaft and together define [describing] a cylindrical [circumference] form extending along [the] a cylindrical axis of the blower;

a second cross-flow blower section, comprising a plurality of radial blades, further comprising a plurality of internal hubs and two end hubs, each of said internal and end hubs coupling with a second shaft and together define an [describing the same] adjacent cylindrical [circumference] form to [as] the internal and end hubs of the first cross-blower section and extending to and along [the] a same cylindrical axis of the second cross-flow blower as the first cross-flow blower;

a flange [comprising two ends, the first end] coupling to the first and second shafts of the first and second blowers, respectively, [the second end coupling] and to the housing;

said flange also comprising two edges, a leading edge and a trailing edge, wherein the leading edge couples to the housing at a leading edge point, and wherein the trailing edge couples to the housing at a trailing edge point, and [where] wherein the leading edge point, [and] the trailing edge point and the cylindrical axis [describe an arc coaxial] define an acute angle within the full angular extent of [to] said cylindrical form [circumference, said arc having an arc angle in the range of 50° to 10°].

2. (Amended) A gas discharge laser as in Claim 1, said flange not coupling to said lower electrode support [comprising:

a housing;

an upper electrode;

a lower electrode;

a lower electrode support;

a first cross-flow blower section, comprising a plurality of radial blades, further comprising a plurality of internal hubs and two end hubs, said hubs describing a cylindrical circumference extending along the axis of the blower;

a second cross-flow blower section, comprising a plurality of radial blades, further comprising a plurality of internal hubs and two end hubs, said hubs describing the same cylindrical circumference as the hubs of the first cross-blower section and extending to and along the axis of the second cross-flow blower;

a flange comprising two ends, the first end coupling to the lower electrode support, the second end coupling to the housing;

said flange also comprising two edges, a leading edge and a trailing edge, wherein the leading edge couples to the housing at a leading edge point, and wherein the trailing edge couples to the housing at a trailing edge point, and where the leading edge point and trailing edge point describe an arc coaxial to said cylindrical circumference, said arc having an arc angle in the range of 50° to 10°].

3. (Amended) The gas discharge laser of any of claims 1 or 2, wherein [the flange] a cross-section of the flange has an aerodynamic shape with respect to a direction of the flow of laser gas.

24. (Amended) A gas discharge laser, comprising:

a housing;

an upper electrode;

a lower electrode;

a lower electrode support; and

[A] a cross-flow blower [for a gas discharge laser], comprising a first shaft and a second shaft, wherein each of the shafts comprise an end portion, wherein each end portion [having] includes a center cross-sectional area, a first end cross-sectional area and a second end cross-sectional area, wherein the center cross-sectional area has a diameter greater than the diameter of the first end cross-sectional area, and wherein the center cross-sectional area has a diameter greater than the second end cross-sectional area.

25. (Amended) The cross-flow blower of Claim 24, wherein each shaft end portion has a constant radius of [curveture] curvature.

26. (Amended) The cross-flow blower of Claim 24, wherein each shaft end portion has a varying radius of [curveture] curvature.

31. (Amended) A gas discharge laser, comprising:

a laser tube filled with a gas mixture;

a plurality of electrodes, including a pair of main discharge electrodes, within the discharge chamber [connected to a discharge circuit] for energizing the gas mixture;

a optical resonator for generating a laser beam; and

a cross-flow blower assembly including a pair of longitudinally adjacent and coaxially disposed cylindrical cross-flow blowers, and

a flange supportingly disposed [therebetween] between said pair of cross-flow blowers, wherein said flange [cross-sectionally] angularly overlaps a cylindrical cross-sectional perimeter of said blowers by less than 50%.

32. (Amended) A gas discharge laser, comprising:

a laser tube filled with a gas mixture;

a plurality of electrodes within the discharge chamber [connected to a discharge circuit] for energizing the gas mixture, said plurality of electrodes including a pair of main discharge electrodes spaced apart by a discharge volume;

[a] an optical resonator for generating a laser beam; and

a cross-flow blower assembly including a pair of longitudinally adjacent and coaxially disposed cylindrical cross-flow blowers, and

a flange supportingly disposed [therebetween] between said pair of cross-flow blowers, wherein said flange [is cross-sectionally non-overlapping] angularly does not overlap a downstream arc of a cylindrical cross-sectional perimeter of said blowers.

33. (Amended) The laser of Claim 32, wherein said downstream arc is [cross-sectionally disposed] defined between said flange and said discharge volume within a cross-section of said laser permitting substantial interflow between portions of the gas mixture circulated by each of said pair of blowers before said portions reach the discharge volume.

34. (Amended) A gas discharge laser as in Claim 32, further comprising an electrode support bar for supporting one of the pair of main discharge electrodes [:

a laser tube defined by a support housing filled with a gas mixture, said support housing including an outer enclosure;

a plurality of electrodes within the discharge chamber connected to a discharge circuit for energizing the gas mixture, said plurality of electrodes including first and second main discharge electrodes spaced apart by a discharge volume, said first main electrode being supported proximate to outer enclosure,

said second main electrode being supported by an electrode support bar coupled at either end with said outer enclosure;

a optical resonator for generating a laser beam; and

a cross-flow blower assembly including a pair of longitudinally adjacent and coaxially disposed cylindrical cross-flow blowers, and

a flange supportingly disposed therebetween,] wherein said flange is coupled to said support housing and supportingly at said blowers, [apart from said electrode support bar] and said flange is not coupled directly to said electrode support bar.

35. (Amended) The laser of Claim 34, wherein said flange is coupled to said support housing only at said [outer enclosure] support housing and supportingly at said blowers.

36. (Amended) A gas discharge laser as in Claim 32, further comprising an electrode support bar for supporting one of the pair of main discharge electrodes, wherein said flange is coupled to the electrode support bar [:

a laser tube defined by a support housing filled with a gas mixture, said support housing including an outer enclosure;

a plurality of electrodes within the discharge chamber connected to a discharge circuit for energizing the gas mixture, said plurality of electrodes including first and second main discharge electrodes spaced apart by a discharge volume, said first main electrode being supported proximate to outer enclosure, said second main electrode being supported by an electrode support bar coupled at either end with said outer enclosure;

a optical resonator for generating a laser beam; and

a cross-flow blower assembly including a pair of longitudinally adjacent and coaxially disposed cylindrical cross-flow blowers, and

a flange for coupling said blowers with said outer enclosure of said support housing apart from said electrode support bar].

37. (Amended) The laser of Claim 36, wherein said flange further couples said blowers to said support housing [only at said outer enclosure].

38. (Amended) A gas discharge laser, comprising:

a laser tube defined by a support housing filled with a gas mixture;

a plurality of electrodes [within the] defining a discharge [chamber] volume within the laser tube, the electrodes [connected to a discharge circuit] for energizing the gas mixture, said plurality of electrodes including first and second main discharge electrodes spaced apart by [a] the discharge volume;

a optical resonator for generating a laser beam; and

a cross-flow blower assembly for circulating the gas mixture through said discharge volume, said cross-flow [blow] blower assembly including a shaft [rotated by a motor], said shaft including a coupling segment with a longitudinally non-uniform thickness, such that when said blower vibrates in bending mode, said coupling segment rocks smoothly within a mating coupling of the support housing.

39. (Amended) The laser of Claim 38, wherein said coupling segment includes a narrowed end portion [around] which is slightly thinner than a thicker middle portion.